In discussing the strength of struts, the author points out that the chief difficulty in dealing with struts lies in the choice of the safe stresses per square inch for various values of the buckling factor, and the effects of eccentric loading of stanchions illustrate how desirable it is to have the load as central as possible. In the chapter devoted to masonry structures, there is a good deal of matter not usually found in text-books, and a brief reference is given to the recent developments of the theory of stresses in masonry dams, due to the original researches of Prof. Karl Pearson; and, in deducing formulæ for the strength of retaining walls, three theories are explained—the Rankine, the wedge, and the Scheffler.

In dealing with the subject of reinforced concrete, the author points out that a great deal of experimental work is still required in this direction before the principles underlying design shall be established on a sure and certain foundation, and he points out the danger of the uninitiated using data obtained from investigations on materials quite different from those which he proposes to use in his own design. The last three chapters are devoted to designs of steel work for various buildings, roofs and bridges, and a number of excellent practical details are given, and illustrations of recent structural steel work.

This book undoubtedly marks a considerable improvement in the type of text-book which has recently been placed at the disposal of engineering students in connection with the theory and design of structures. There are original methods of dealing with problems, the theory is in all cases unimpeachable, and the numerous examples selected for illustrating these various theories have been chosen with admirable judgment. The book, however, is more than a mere text-book for students; it will be found of considerable use by draughtsmen and engineers who are engaged in constructional steel and iron work.

(2) Though this book has been written mainly for engineering students, and from the point of view of university examinations, it will undoubtedly prove most useful to practical engineers. So many text-books have now been written on this subject that it becomes extremely difficult for an author to embody anything strikingly original. Prof. Morley has, however, devoted considerable attention to several branches of the subject which are ordinarily passed over, or only briefly touched upon in most of the works dealing with the subject of strength of materials.

In chapter ii. there is a *résumé* of the theories which are held as to whether or not, in cases other than simple direct stresses, the breaking down of a bar in a machine or structure occurs for a certain value of the maximum principal stress, for a certain value of the maximum principal strain, or for a certain value of the maximum shearing stress. Throughout the book the first of these theories is generally employed, but its use has to be justified by the choice of a factor of safety which is reckoned on the ultimate and not on the elastic strength of the material, and which must be varied according to circumstances.

In chapter xii., the problems involved in the strength of rotating discs and cylinders are fully investigated, and also the bending of originally curved bars, such as crane hooks, for example. The strength of flat plates is treated in chapter xiii. in a very complete manner by means of the Bernouilli-Euler theory of bending, with such modifications as are required to allow for flexure in other than a single plane. Another useful chapter is that devoted to the subject of vibrations and critical speeds, in which is incorporated the results of Prof. Dunkerley's researches on the whirling speed of rotating shafts. In chapter xvi., Prof. Morley has given descriptions of a number of the special testing machines which have been introduced in recent years for impact and hardness tests, and copious references have been given to the memoirs which have been published dealing with researches and investigations undertaken with the aid of these special machines.

Every chapter contains a number of fully-worked-out examples, and there is a good selection of examples for practice by the student, and, in the form of an appendix, are given tables of logarithms, such as would be required in the working out of these examples.

The book is a valuable addition to the library of the engineer who has to undertake the calculation of the stresses and strains in machinery and structures.

## WIRELESS TELEGRAPHY.

*An Elementary Manual of Radio-telegraphy and Radio-telephony for Students and Operators.* By Dr. J. A. Fleming, F.R.S. Pp. xiv+340. (London: Longmans, Green, and Co., 1908.) Price 7*s.* 6*d.* net.

*La Télégraphie sans Fil et les Applications pratiques des Ondes électriques.* By Albert Turpain. Second edition. Pp. xi+396. (Paris: Gauthier-Villars, 1908.) Price 9 francs.

*Jahrbuch der drahtlosen Telegraphie und Telephonie.* Vol i., part iv. Edited by Dr. Gustav Eichorn. (Leipzig: Verlag von S. Hirzel, 1908.)

WE have already had occasion to review in these columns Dr. Fleming's treatise on "The Principles of Electric Wave Telegraphy," and at the time we expressed the opinion that that treatise not only admirably filled a gap in the literature of the subject, but deserved to rank as the most important, if not the only, book on wireless telegraphy which students need consult. It must be frankly admitted, however, that by writing the present manual Dr. Fleming has performed another service to this branch of electrotechnology, in the exposition of which he stands, certainly in this country and probably in any country, easily first. The former treatise was possibly too exhaustive and in parts too difficult for those who had not the ability or inclination to study the subject thoroughly. It must be remembered that wireless telegraphy has become in recent years a department of applied electricity of great practical importance, offering a steadily increasing field of employment for large numbers of men. The majority

of those who are engaged or who seek engagement in this work are hardly to be expected to have any desire to pursue its study into its more difficult theoretical parts; to such the present volume will prove an adequate guide. To others it will serve as a useful introduction to its more comprehensive predecessor.

A *résumé* of the contents is unnecessary; the whole subject is discussed, both in its theoretical and practical aspects, but the treatment throughout is simple, and of such a character that any student with a good grounding in general electrical science and quite moderate mathematical attainments can follow with ease. That the explanations are lucid and the illustrations plentiful and well chosen goes without saying in reference to any book from Dr. Fleming's pen.

Of special interest in the present volume are the passages dealing with the production of continuous trains of undamped oscillations by the method of Duddell's musical arc, and in other ways, as this field was barely touched when the previous treatise was published. For the same reason the final chapter on radio-telephony will be read with particular interest. It is to be noted that articulate speech has been successfully transmitted, in more than one instance, over about 200 miles, and musical sounds about half as far again. As Dr. Fleming says, wireless telephony stands now much in the position in which wireless telegraphy stood ten years ago. Time will show whether it can be developed to be of equal utility and service to man.

M. Turpain's book does for the French student much what Dr. Fleming's does for the English. To attempt an estimation of the relative merits of the two volumes would be an ungrateful task; suffice it to say that the treatment in M. Turpain's book is somewhat less full, but is in all respects clear. In addition, M. Turpain deals with two or three subjects not falling strictly under the classification wireless telegraphy, but closely allied thereto on account of their utilisation of Hertzian waves. These are the application of Hertzian waves to the problems of multiple signalling in ordinary telegraphy with wires; to the control of moving apparatus, such, for example, as torpedoes, from a distance; and to the study of storms and atmospheric disturbances. There are also two chapters dealing with high-frequency currents and their utilisation for electric lighting. The inclusion of these subjects gives the book a special value, as, to the writer's knowledge, there is no other comprehensive *résumé* thereof in existence.

Attention may be directed to the paragraph which closes the first portion of the book which treats of wireless telegraphy alone. The opinion is expressed that wireless telegraphy is not likely to replace any of the existing means of communication, but is destined to find its special sphere in increasing the security—and may one add, the amenity?—of navigation. This view has been frequently put forward in these columns, but as, in the writer's opinion, extravagant claims still continue to be advanced for wireless Transatlantic communication, and large sums of money spent on its development which might be better utilised in less ambitious ways, there can be no harm in its repetition. How wonderfully useful wireless telegraphy has become for the purposes of navigation was strikingly demonstrated for all the world to admire in the case of the wreck of the *Republic* at the end of January.

The fourth number of the *Jahrbuch der drahtlosen Telegraphie und Telephonie* calls for no special comment. Partaking more of the character of a scientific society's journal, reviewing, in the ordinary sense, is more or less impossible. There are a number of original communications on various matters connected with wireless telegraphy, and reports on several practical developments. In addition, the number contains a reprint of the German Act regulating wireless telegraphy according to the international agreement of 1906.

MAURICE SOLOMON.

## OUR BOOK SHELF.

*Handbuch zur Geschichte der Naturwissenschaften und der Technik.* In chronologischer Darstellung. Zweite, umgearbeitete und vermehrte Auflage. Von Prof. Dr. L. Darmstaedter. Unter Mitwirkung von Prof. Dr. R. du Bois-Reymond and Oberst. z D. C. Schaefer. Pp. x+1262. (Berlin: Julius Springer, 1908.) Price 16 marks.

THIS work is a sort of scientific dictionary of dates, in which all the most important discoveries and inventions in the world are arranged in chronological order from the year 3500 B.C. down to nearly the beginning of the present year of grace. The first important invention noted by the editors is that of the so-called Palmyra books, in which palm paper was first used for writing, the letters being pressed into the leaves by means of a graver or style, and then made visible by being rubbed over with oil and soot. This invention is ascribed to the Hindu Sage Panningrishee, of Arittawarum, on the Ganges. The latest invention chronicled is that of Count Zeppelin's airship which came to grief on August 5 of last year.

It needs 1070 large octavo pages to describe, in the shortest of paragraphs, all the more significant inventions and discoveries which have been made in the space of these 5400 years. Of course, in the earlier years the discoveries and inventions are few and far between, and centuries even elapse before anything can be discovered worth noting, and it is practically only in the beginning of the sixteenth century that each succeeding year is found to produce something sufficiently important to be set down. These great gaps are, of course, due to the imperfection of the records. No doubt many things were discovered, especially in the East, of which all traces have been lost or at least not hitherto detected, for there is good reason to believe that many inventions of later times usually credited to Europeans ought to be ascribed to the people of the East. From the year 1500 onwards practically every year furnishes discoveries and inventions which merit being chronicled.

The plan of the work leaves nothing to be desired as regards simplicity and convenience. The book has a name- and subject-index, but whether the latter is as systematically arranged as is possible is open to doubt. Anyone consulting the work with a view to ascertain the date of a particular discovery